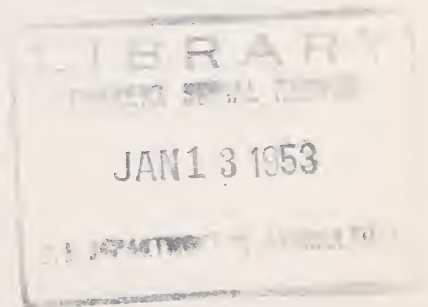


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**REPORT OF THE CHIEF OF THE BUREAU OF
HUMAN NUTRITION AND HOME ECONOMICS
AGRICULTURAL RESEARCH ADMINISTRATION
1952**



UNITED STATES DEPARTMENT OF AGRICULTURE



Report of the Chief of the Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, 1952

UNITED STATES DEPARTMENT OF AGRICULTURE,
Washington, D. C., September 15, 1952.

Dr. B. T. SHAW,
Agricultural Research Administrator.

DEAR DR. SHAW: I submit herewith the report of the Bureau of Human Nutrition and Home Economics for the fiscal year ended June 30, 1952.

Sincerely,

HAZEL K. STIEBELING,
Chief.

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INTRODUCTION

Conducting research for the benefit of the homemaker and her family is the concern of the Bureau of Human Nutrition and Home Economics—work as important to the consumer as that done by other Government agencies is to the farmer, the business man, the wage earner. Much of the Bureau's research is designed to further well-being of the people of the United States by determining more effective ways to use the food, fiber, and other products of the Nation's farms.

The Bureau also does research on economic problems of the rural family and factors that influence their levels of living; and on rural housing, household equipment, and household buying. Offices and laboratories within the metropolitan area of the District of Columbia are maintained for this work. The Bureau is enabled to advance its program more steadily by arranging some cooperative and contract research with other agencies, to supplement research undertaken alone. This year's work includes 21 cooperative projects and 37 under contract arrangements.

The major responsibility of the Bureau is research basic to programs for better nutrition. The United States, with its bountiful food supply, has relatively little acute undernutrition, but Bureau studies of food consumption suggest that there are still many families, rich as well as poor, who would be better off nutritionally if they got more milk, more leafy green vegetables, and more vitamin C-rich vegetables and fruits, such as raw cabbage, tomatoes, and citrus fruit. By contrast, the Nation's per capita need for foods that are important chiefly for calories is relatively less than it was a generation or so ago—because proportionally fewer people in this country are doing heavy manual work requiring large amounts of fuel foods, and the proportion of older, less active people in the population is increasing. The Bureau thus defines nutritional goals for the Department's food and nutrition programs, both short- and long-term, which keep step with population trends and look toward serving an increasingly nutrition-conscious and nutritionally informed public.

With increased production a major national problem, the Bureau is giving special attention to research that will help to promote effective utilization of food by consumers—preventing waste and making wise use of whatever supplies are available. The Nation's welfare is advanced by using effectively what is produced, no less than by the actual production of greater amounts of food and fiber.

NUTRITION RESEARCH FINDINGS

This country's impressive advances toward good nutrition are made possible in part by advances in research-based knowledge. Item by item, technical studies add to our understanding of the values of foods for human well-being and the intricate work of nutrients within the body.

Following are some examples of latest research in these fields carried out in the Bureau's laboratories or by cooperative or contract arrangement with agencies in the States.

Energy Requirements of 9- to 11-Year-Olds

At the 9- to 11-year stage of growth, normal active boys and girls have high calorie needs. Accurate knowledge as to just how high these needs are is essential for effective planning of diets. Experiments to measure the amount of energy used for different kinds of work and play at this period of life have made considerable progress in a study cooperatively arranged with Columbia University.

The table below shows calories per hour used by a 70-pound boy and girl in a few of the activities that have been studied.

Activity:	<i>Calories per hour</i>	
	<i>Boy</i>	<i>Girl</i>
Sitting drawing-----	72	67
Washing and wiping dishes-----	93	83
Standing drawing-----	102	83
Walking slowly-----	120	115
Dressing and undressing-----	136	129
Walking moderate speed-----	178	165
Roller skating-----	196	166

In summary, the findings show that energy used when resting—basal metabolism—is slightly higher for boys than for girls (49 calories per hour for a 70-pound boy, 47 for a 70-pound girl), and that in various activities boys consistently exert themselves more than girls. Both boys and girls use more energy per pound of weight than adults to carry on the same activity.

Nutrition in the High School Age

Information on diets and nutritional condition of children of high school age has been obtained through research initiated in 1948 in cooperation with the Oregon Agricultural Experiment Station and dental and health authorities. The varied evidence includes records of what the 14- to 16-year-old children ate, indicators of nutritional state, such as biochemical facts determined from fingertip blood samples and salivary analyses, and information on condition of teeth. Nine technical reports have been issued to date.

The most recent report, presenting what was learned from blood samples of 766 children living in two coastal and two inland counties, shows that the majority rated high in serum vitamin A, serum ascorbic acid, hemoglobin, hematocrit, and plasma protein. While the general picture was good, an appreciable number of children rated relatively low by one or another of these indicators. Children living inland had higher serum vitamin A and higher hemoglobin values than those on the coast. In general, girls were found to have higher serum ascorbic acid values than boys, whereas boys had higher values for serum vitamin A, hemoglobin, and hematocrit.

The food habits of these teen-age children were such that more than 60 percent met the National Research Council allowances for the nutrients evaluated, except for iron and ascorbic acid. More than 90 percent of the children had diets providing at least two-thirds of recommended amounts of protein, thiamine, riboflavin, niacin, or vitamin-A value, already mentioned. In general, boys' diets appeared to be superior to those of girls except for ascorbic acid. Although the estimated average number of servings of vegetables and fruits did not differ greatly—47 servings per week for the girls and 45 for the boys—two-thirds of the girls were found to have serum ascorbic acid levels of 0.7 milligram percent or more as compared with half of the boys. However, only 25 percent of the boys and 14 percent of the girls had serum ascorbic acid levels below 0.4 milligram percent.

The only clinical measures of sound body structure and function summarized to date are those relating to dental health. At each chronological age the boys experienced a lower rate of caries attack than did the girls. In addition to a tendency toward better diets, the better teeth of boys at each age may be attributed in part to the fact that teeth of boys erupt later than those of girls. In general, fewer decayed, missing, or filled teeth were found inland than on the coast. This regional difference could not be attributed to consistent regional differences found in quality of diet or to the hardness or the fluorine content of public water supplies. The only environmental difference noted that might be relevant was the amount of sunlight. The inland counties have more sunshine, although it is not yet known whether it provides more ultraviolet light.

Comparatively low incidence of caries was found among 49 children 14 to 16 years of age living in a rural institution in the Willamette Valley of Oregon, a section where the usual rate of dental caries among children of these ages is similar to that found in the coastal counties. The better condition in the institution was attributed to a nutritionally adequate diet, including daily supplements of vitamins A and D, and the institution's limited use of refined sugars and sweets. The fluorine content of the water used by the institution was higher than in the usual water supplies of Oregon, but was insufficient to account for the markedly lower rate of caries attack.

Amino Acid Requirements

Seeking to learn more about the intricate teamwork among amino acids—the nutritive units of food proteins—the Bureau has used laboratory animals to determine whether certain nonessential amino acids lessen the body's requirements for essential amino acids. It has long been known that cystine, a nonessential amino acid, helps to lower the requirements for the essential amino acid methionine in growing rats. It has now been shown that this also holds true for the adult rat. However, Bureau studies indicate that presence or absence of nonessential amino acids has no influence on the amount required of two other essential amino acids—threonine and isoleucine.

When Diets Fall Short

Little has been known as to whether dietary deficiencies work greater hardship on one sex than the other. Experiments with growing and adult rats, in the Bureau's laboratories, provide some information on effects of deficient protein. When protein was low in quantity or of poor quality in diets otherwise good, young female rats were less seriously retarded in growth than the males. Likewise among adult animals, gross protein deficiencies caused less pronounced malnutrition with a lower death rate during the experimental period among females than among males. On the other hand, when young rats had diets adequate in all respects, young male rats gained weight more rapidly than the female.

Some effects of too little fat in diet have been shown by experimental work done by contract at the medical school of the University

of Texas. Importance in the diet of minimal amounts of certain fatty acids is demonstrated for health of skin of children, as well as of puppies and rats.

Nutrients in Foods

It is increasingly evident that the body is able to use many of the nutrients in foods only to a partial extent. Furthermore, nutrients dwindle in some instances during commercial processing of food or kitchen preparation. In all such cases, the net amount of the nutrient that the body actually uses, rather than the gross amount in the food, becomes the final criterion of value.

CAROTENE.—A marked superiority of leafy green over yellow vegetables in the proportion of their carotenes that the body can use for vitamin A was reported earlier by the Bureau. A possible explanation for the difference has been sought in xanthophyll, a substance abundant in leafy green but almost entirely lacking in yellow vegetables. To test the effect of pure xanthophyll upon bodily utilization of pure β -carotene, laboratory rats depleted of vitamin A were given xanthophyll alone, β -carotene alone, and the two in combination. Xanthophyll alone did not restore growth in these depleted animals, nor did its combination with β -carotene affect in any way the activity of the carotene in promoting growth.

FATTY ACIDS.—Information on the effects of cooking on fatty acids in cooking fats—lard and vegetable oil—and in various cuts of meat has been obtained in experiments arranged by contract with Syracuse University. Destruction of fatty acids in ordinary home baking and top-of-stove cooking proved negligible. The greatest destruction occurred when vegetable oil was used in deep-fat frying for several hours, but the loss was minor even after so much heating.

PROTEINS.—Damage to the nutritive value of cottonseed meal by some commercial processing methods has been demonstrated in research in cooperation with the Bureau of Agricultural and Industrial Chemistry. A meal from which oil was extracted by screw press with maximum heating of 180° F. was significantly higher in protein value than a meal similarly processed at 230° F. maximum temperature or a meal processed in a hydraulic press. Production of cottonseed meals with little damage to the protein would enhance its value for use in animal feeding and thus indirectly, if not directly, affect human nutrition.

BETTER FOODS, BETTER USE

Nourishment From Bread

The Bureau's most recent survey of family food consumption shows that the average city family uses nearly a pound and a half of bread per person in a week, and some families use as much as three pounds. It is obvious that bread carries responsibility for providing much nourishment. Enrichment of white bread with three B vitamins and iron is compulsory in 26 States and 2 territories, and enrichment with calcium is permitted by law, though not widely practiced. Because calcium is one of the nutrients frequently low in city diets—

lagging behind recommended amounts in the diets of more than one-third of urban families—the Bureau has undertaken to find out how much calcium is now provided by bread, and how much of the total calcium in bread is attributable to milk, an important food source of this element.

The Bureau has determined the total calcium content of 402 samples of commercial white bread from 41 States and the District of Columbia and found the average content to be 334 milligrams per pound loaf. Of this calcium, 35 percent was estimated to be derived from milk. The remainder was supplied by the flour and such ingredients as mold inhibitors and dough conditioners. So wide was the variation in calcium content of these breads that an individual eating the city dweller's average amount of bakers' white bread—1.44 pounds a week—could get as little as 1 percent of his recommended calcium allowance from bread, or as much as 16 percent.

As a way of improving breads served in school lunches, the Bureau in 1950 developed five formulas for breads containing 6 to 10 percent milk solids, and varied by use of raisins, whole wheat flour, soy flour, wheat germ, and brewers' yeast. Laboratory analyses of the resulting breads have led to further improvements in the formulas and these have been published during the past year. The formulas, intended for use by schools in drafting specifications for bread orders placed with commercial bakers, have found favor with many school lunch managers, and with institutions such as hospitals, as well.

Food Purchased Versus Edible Yield

Efforts are being made to obtain facts on the amount of usable food that the consumer gets from various commodities when bought in various forms, under differing market conditions, and wanted for different purposes. Food industries and consumers alike have need of this type of information. It has special importance for Bureau tables showing the nutrients to be expected from a unit of weight as purchased.

APPLES.—New evidence of the types and extent of deterioration that occur as apples move from farm to kitchen comes from an investigation into the yield of apples, which the Bureau made with other Department agencies. Edible tissue ranged from 64 to 80 percent of the weight as purchased when samples of widely marketed apple varieties were bought from retail stores in successive years. Core and peel alone accounted for 11 percent, sometimes more, of the apple's weight. The remainder of inedible material was due to bruising—the most frequent kind of damage—and to cuts, rot, insect injury, and physiological breakdown of the fruit in progressive handling and storage. When marketed apples were appraised for baking, which calls for whole and unblemished fruit, only 36 percent by weight of Rome Beauty samples were found suitable, and this was the highest rating among 10 varieties studied.

POTATOES.—The effect of potato variety and paring methods on edible yield is shown by experiments in the Bureau's laboratories. With hand paring, the yield was 81 to 89 percent. Since contour of the potato can be followed closely in hand paring, there was little

difference in yield from different potato varieties. With time-saving machine paring, yields ranged from 51 to 84 percent in different varieties. When averages were taken for machine-pared samples of six varieties, grown in different locations and in three different years, Russet Burbank gave greatest yield; Katahdin and Chippewa next; and Triumph, Green Mountain, and Irish Cobbler the lowest.

SMOKED HAMS.—Information on yield of cooked edible portion from smoked hams has been obtained, using data from earlier experiments that were in cooperation with the Bureau of Animal Industry and the Bureau of Agricultural Economics. When 18 dry-cured, farm-stored hams were weighed after baking, cooked lean meat and intermuscular fat averaged 50 percent and cooked external fat 27 percent of the weight, the remaining 23 percent being skin, bone, and inedible trimmings.

FRUITS AND VEGETABLES.—Yield of a number of fruits and vegetables for home-freezing has also been determined by the Bureau. These figures are derived from produce bought in local grocery stores and include considerable variation in quality. They show that if the homemaker is to package a pint of food for freezing, she needs, for example, two-thirds to 1 pound of snap beans; 2 to 2½ pounds of lima beans or peas in the pod; 1 to 1½ pounds of peaches or plums; two-thirds of a quart of strawberries.

Home Cooking Research

Developing new and varied ways of using foods abundant in this country's supply, and improving basic cooking methods are part of the Bureau's food research program.

DRY BEANS.—To speed home preparation of dry beans—ordinarily one of the more time-consuming types of home cookery—the Bureau has conducted studies with five bean varieties. A quick method of soaking makes it possible to get dry beans ready for cooking in an hour. Directions for pressure cooking beans, to overcome certain problems that homemakers encounter, have been developed. Besides its technical report, the Bureau has published a leaflet for homemakers giving up-to-date methods of cooking, and a number of recipes for dry beans, dry peas, and lentils.

EARLY-CROP POTATOES.—Suitability of early-crop or "new" potatoes for various types of cookery was tested in experiments in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering. Sample lots of early Triumph, Sebago, Irish Cobbler, and White Rose varieties were obtained from various locations. Samples from all lots held shape well during cooking and were good for boiling and salad making, and the two with highest percentage of dry matter were satisfactory for mashing. All samples were too moist and soggy to be desirable for baking or french frying. Some samples had high content of reducing sugar which caused excessive browning of french fries.

APPLES.—Supplementing the better known recipes for using apples, a leaflet on apple cookery was prepared, incorporating new recipes and some variations on old favorites. In line with current efforts to

help purchasers choose commodities that will suit intended use, the leaflet gives pointers on characteristics of 12 widely marketed apple varieties and their best uses.

POULTRY.—A method for roasting small young turkeys of the fryer-roaster class was developed for use in experiments in cooperation with the Bureau of Animal Industry on the eating quality of birds fed on experimental diets. The roasting directions have been publicized as offering an easy and attractive way to serve the small turkeys, many of which weigh no more than sizable chickens.

Food Quality in Relation to Production Factors

In cooperative research with the Bureau of Animal Industry to learn whether eating quality of poultry is affected by treatment with estrogens—one of the newer techniques for improving finish for marketing—18 male turkeys of the Beltsville Small White variety, estrogen-treated, were compared with 18 birds not so treated. The turkeys were of the fryer-roaster class, 11 to 15 weeks old. The taste panel report showed no significant difference between the two groups of birds in tenderness, moistness, or flavor of the flesh. Skin flavor of untreated birds was rated higher than that of treated.

Data from earlier experiments on turkeys, in cooperation with the Bureau of Animal Industry, have been evaluated and published for any light they may shed on the effects of starting diets on flavor. Taste-panel ratings on eating quality of 68 birds from 8 to 26 weeks old showed that certain fish oils and fish meals fed to baby turkeys produced off-flavors which persisted even when the fish products were excluded from the growing diets after the first 8 or 9 weeks. These findings have special importance, in view of the expanding production of fryer-roaster turkeys, and have led the Bureau of Animal Industry to recommend restrictions in the use of fish products in starting diets.

Questions as to effects on food flavor of some of the newer chemicals used to protect crops against insects have led the Bureau of Entomology and Plant Quarantine and other agencies to request this Bureau to undertake palatability tests on certain products. It has been found, for example, that there were only minor differences in flavor between sweetpotatoes from untreated plants and from plants treated with toxaphene or chlordane dusts or DDT emulsion spray, or grown in soil treated with chlordane; whereas sweetpotatoes grown on plants dusted with, or in soils treated with, technical benzene hexachloride were only fair to poor in eating quality because of undesirable off-flavors. In studies on white potatoes grown in soils treated with lindane (99 percent gamma benzene hexachloride), off-flavors varying from slight to intense and undesirable with increasing dosage rates were observed in the cooked potatoes. Definite off-flavors in potatoes grown in soils used the previous year for growing peanuts treated with lindane or benzene hexachloride demonstrated that there can be sufficient season-to-season carry-over of these insecticides to impair flavor of food crops. Off-flavors associated with the use of benzene hexachloride insecticides have also been observed in studies on carrots, radishes, lima beans, tomatoes, peaches, and peanuts.

Home Freezing and Canning

Satisfactory directions for freezing french-fried potatoes and glazed sweetpotatoes have been developed by the Bureau to meet consumer requests and to provide additional household uses of these vegetables.

Because of homemakers' interest in using corn sirup or honey as well as sugar in freezing and canning fruit and in putting up fruit with no sweetening for baking or special diets, fruit packs with various sweetenings and with none have been compared.

Using strawberries—a very popular fruit for home freezing—Bureau specialists have found that while the frozen product is best in flavor when packed with one part sugar to four parts fruit, strawberries were acceptable when packed in a 40-percent sugar sirup or a sirup in which one-fourth of the sugar sirup was replaced by corn sirup. Lowest in flavor were strawberries frozen without sweetening or with 100-percent corn sirup.

Peaches, the most popular fruit for home canning, were rated satisfactory in flavor when canned with sugar or with one-third, one-half, or three-fourths of the sugar replaced by light corn sirup. These are larger proportions than the 30-percent corn sirup used in experiments reported earlier (Report of the Chief of the Bureau of Home Economics, 1941). Methods employed in the two studies differed. In this study the peaches were canned in their own juice released upon heating, whereas in the former study the peaches were canned in sirup made with water. Replacing sugar, honey of medium color and fairly mild flavor gave home-canned peaches a less desirable flavor, even when the honey replaced only one-third of the sugar.

New Food Guide

More and more people in this country are living beyond 3-score years, and their very numbers—about 12 million were 65 years or older according to the 1950 census—draw attention to the special needs of older people. A "Food Guide for Older Folks," issued during the past year, is a much-requested addition to the series in which the Bureau has endeavored to apply the latest nutrition knowledge to everyday food management at different stages of the family life cycle. The guide for older people gives information on using a food plan for good nutrition, supplemented by up-to-date information on nutrition and weight control, and suggestions for meeting problems that older people frequently face, such as cooking for one or two, cooking with little equipment, and having a good diet when food must be easy to chew.

RURAL FAMILY LIVING

Reports on the Economic Situation of Families

The Bureau has been called upon increasingly in the past decade to interpret the current economic situation to families and to report adjustments that farm families are making in this period of economic change. Because of the responsibilities assumed by the family eco-

nomics staff in preparing for and holding the annual Agricultural Outlook Conference, many of the materials along this line are prepared specifically for the use of home management specialists and other home economists connected with the State Extension Services. However, these materials are being requested more and more by high school and college teachers, members of welfare agencies, agricultural economists, and by others for use with adult education groups and foreign visitors needing background information on family living conditions in the United States.

Each year a chart book on family living has been prepared specifically for the annual Agricultural Outlook Conference. This publication has a wide distribution each year among persons not attending the conference. It brings together pertinent material from research studies carried on by the Bureau and also from other Federal agencies such as the Bureau of the Census, the Bureau of Labor Statistics, the Rural Electrification Administration, and the Bureau of Agricultural Economics.

Through the year, three or four issues of an informal publication titled "Rural Family Living" continue this current reporting. It includes sections on the economic situation, the outlook for food, clothing, and housing, and other subjects of interest to those guiding family spending. A new feature introduced a year ago is the "Estimated cost of one week's food according to Bureau of Human Nutrition and Home Economics food plans." Thus the cost of feeding a family of four according to the low- or moderate-cost food plans published by the Bureau is being brought up to date with each new issue of Rural Family Living.

Rural Family Living Levels

During the past 8 years the Bureau has made a series of studies of families living in selected rural localities in the United States. These studies have been planned to give clues to changes in consumption practices since the last national survey of rural family consumption made in 1942, as well as to show differences in consumption among families living in different parts of the country. The latest addition to this series deals with levels of living in two rural counties of a southern State.

With increased industrialization of rural areas, an increasing proportion of families living on farms derives money income primarily from nonfarm sources. Farm families as defined by the United States Census are far from a homogeneous group. A study of rural families in Lee and Jones Counties, Mississippi, provided an opportunity to learn differences in spending and consumption patterns in two counties where industrialization had increased. Families included in the study were divided into three groups: Rural nonfarm families who were clearly not farming but lived in the open country or in villages; farm-operator families who were producing for the market; and a marginal group of farm families who were conducting only nominal farming operations for market purposes but who had income from nonfarm sources.

Based on indicators such as spending, housing, and dietary levels, the rural nonfarm families appeared to have higher levels of living than the marginal farming group. These in turn had higher levels of living than the farmers producing for the market in the counties studied. In diet quality during a summer week, the marginal group of farm families fared better than either of the two other groups. They not only had ready cash from nonfarm employment for their food purchases but also used relatively large amounts of home-produced food.

The study in Mississippi also contributed valuable methodological information relating to cost and reliability of data. Length of interview is a major problem in a survey of income and living levels. One method suggested to shorten the interview for a particular family and still provide the needed detail on expenditures is the use of a "split" schedule. This involves breaking the schedule into several parts and asking about one section, such as food purchases and expenditures, of one group of families and another section of the schedule, such as housing expenditures, of another group. Results are assembled to give a picture of the average expenditures for all categories of the family budget. Such a procedure was used experimentally in the Mississippi study, with a complete schedule taken from a control group of families.

While the interview time for a particular family was reduced by the use of a split schedule from the time required for a complete schedule, the disadvantages were found to be more serious than anticipated. All in all, in the Mississippi study, the split schedule was found to be a relatively expensive procedure. It required a larger sample than did a complete schedule, it increased travel and supervisor costs, and it was found to be open to considerable error in application. Furthermore, the types of analyses possible when the split schedule is used are somewhat limited.

TEXTILE AND CLOTHING RESEARCH

Disinfectants for Cotton Fabric

In previous research, the Bureau found that solutions of disinfectants recommended by manufacturers for use in laundering such articles as baby diapers and sickroom bedding were in general too weak to be effective. The Bureau has now determined the quantities in rinse water of five typical quaternary ammonium compounds, sold under trade names, to treat samples of cotton fabric for three kinds of use: (1) Preventing ammonia formation in fabric, said to cause "ammonia dermatitis," and delaying development of odors in soiled diapers held before washing; (2) sanitizing the fabric by reducing bacterial count to one-tenth of 1 percent; (3) completely disinfecting the fabric.

All five compounds were found capable of delaying ammonia formation and deodorizing for 16 hours, 1, 4, and 7 days, but the compounds differed widely as to strength of solution needed when fabric was treated at different temperatures—68° and 113° F.—and for different lengths of time—5 and 10 minutes. The usual commercial

recommendation for this use is 1 part compound to 16,000 parts water, or 1 ounce compound to 30 pounds of dry cloth. This dilution proved effective for only 16 hours and when rinsing lasted 10 minutes at a temperature as high as 113° F. To prevent odor formation in garments likely to await laundering longer than 16 hours would require much stronger solutions, the findings indicate.

In the experiments with sanitization and disinfection, cloth was inoculated with a test organism, *Escherichia coli*. Sanitization was achieved with each of the five compounds when fabric was treated 15 minutes in 1:5,000 dilution at 113° F. At 68° F. temperature, only two of the compounds provided sanitization under the same conditions of dilution and time of treatment. When bacteria were present in numbers which have been reported typical of final rinse waters in commercial laundries, one compound at 1:4,000 disinfected the fabric. This represents 1 ounce of compound to 7.5 pounds of dry cloth. (Other compounds were not so tested.)

Improved Clothing Construction

Serviceability of clothing, such as women's house dresses and children's garments, is frequently impaired because of weak construction of seams, buttonholes, and patch pockets. To provide research-determined facts on methods of constructing these important details, the Bureau cooperated with the Ohio Agricultural Experiment Station and the Ohio State University and the technical report has now been published.

As examples of findings: Of five kinds of seams compared, the stitched fell seam was strongest and the standing fell weakest, with little difference apparent between plain, lapped, and French seams. In both low- and medium-count fabrics, seams that ran fillingwise of the cloth were stronger than seams that ran warpwise; whereas, on high-count goods, fillingwise and warpwise plain seams were almost equal in strength. Diagonal stitching of patch-pocket corners with tape reinforcement proved strongest of seven methods tried for attaching pockets—four times as strong as retraced stitching and almost twice as strong as rectangular stitching. Next strongest was the diagonal-stitched corner without reinforcement.

To help with the fitting problems of women who are making their own new tailored garments, as well as those who undertake some alterations on ready-mades or old garments to bring them up to date, the Bureau has prepared a 24-page illustrated bulletin. The publication contains a key to the usual cause of common fitting problems in the body of a coat or jacket, in the sleeves, or in the skirt, and suggests ways to correct such faults, whether in a home-tailored or a ready-made garment.

Farm and City Wardrobes

Statistical information on family wardrobes—how they differ in a northern and a southern city, and how they differ in the northern city and two nearby rural counties—is becoming available as a result of the Bureau's pioneering efforts to learn more about clothing practices

in the United States. A sixth preliminary report, issued during the year, presents tabulations on clothing inventories of farm families and a farm-city comparison.

In general, the kinds of clothing owned by farm and city families are very similar, except for work clothes. The more pronounced differences are in quantity of clothing owned, and money spent for it. Husbands and wives on farms owned smaller amounts of about half the items listed than did those in the city; and, taking wardrobes as a whole, had about one-fourth less clothing. The farm men spent less than two-thirds as much for clothes as the city men; and the farm women spent less than half as much as the city women.

A point of similarity between the two groups is the large proportion of the clothing bought new, ready-made. Husbands got about 90 percent of their clothes this way, and wives 80 percent. The statistics provide the first detailed information obtained on the kinds and amounts of clothing for family members received as gifts or home-made, made-over, handed-down, or bought second-hand. Gifts of clothing from persons outside the immediate family are shown to be an important source of clothing for children, and explain in large part the relatively low family spending on children's clothes.

The analyses of clothing inventories and purchases of families living in the two urban centers far apart geographically—Minneapolis-St. Paul, Minn., and Birmingham, Ala.—have shown the existence of considerable differences. However, when differences in climate, family income, and age of the persons participating in the survey are taken into account, few differences in clothing practices remain, indicating that the findings from these surveys can be applied more broadly.

HOUSING AND HOUSEHOLD EQUIPMENT

Rural Housing Needs

Completion of four regional rural housing surveys in cooperation with 34 State agricultural experiment stations has made available for guidance of house planners a fund of information on the kind, scope, and frequency of household activities carried on by farm families in different parts of the country. The studies have also revealed family preferences for the location of activity areas as well as for certain other house design features. Approximately 4,000 families in 42 States were interviewed during the surveys. Homemakers were interviewed in each case and spoke for almost 3½ million households. Here are some of the findings:

More than half the families in Western, North Central, and Southern States would like a one-story house with a basement and two porches. Southern families would add a fireplace. Families in the Northeast prefer a house with more than one story, plus a basement, two porches, a fireplace, and attic. In all regions, most families preferring a house with more than one story want, on the first floor, a bathroom and at least one bedroom.

Homemakers in the Northeast, South, and West agree that for a family with three children (of both sexes), a house of five rooms should have three bedrooms, a living room, and kitchen. For such

a family limited to a four-room house, about half of those questioned favored a two-bedroom, living room, and kitchen arrangement, although almost as many favored a third bedroom in place of the living room.

Among homemakers who say they want more room than they now have, bedrooms rank as first choice when rooms can be added. Most families have one or two overnight guests from time to time. Southern homes have such company more often than those in the Northeast and West.

A majority of homemakers in all sections of the country would like a dining room in addition to dining space in the kitchen, with seating space at both tables for more than the family. About half the families in the Northeast, South, and West say they serve extra persons at family meals as often as once a week.

The survey indicates that almost all homemakers require space for baking. More than half make a cake and two or more pies at least once a week. The majority of Southern homemakers surveyed make both biscuits and corn bread at least once a day.

More than 90 percent of the women preserve food for family use, usually by canning. The kitchen is preferred for preparing foods for preservation, except in the South, where homemakers would rather use the porch. The kitchen ranks first as the preferred place for processing foods, although many women, in the North Central region especially, would like to shift processing to the basement or workroom.

At least 90 percent of the families in each of the four regions do all or most of the family washing at home. A workroom or basement is preferred for this job by a majority of women in the Northeast and West. A basement is the choice of more than half the women in North Central States, and an outside building is preferred by one-third of those in the South. In all but the Southern States a majority of homemakers have washing machines, the electric nonautomatic type predominating. A sheltered place for drying clothes on stormy days is wanted by more than 90 percent in the Northeastern and North Central regions, by about 75 percent in the South, and by 50 percent in the West.

Three-fourths or more of the homemakers do some sewing. About half the women in the Northeastern, North Central, and Western regions who sew prefer a special room; of the Southern women who sew, about one-fourth want a sewing room, almost half would sew in the bedroom. Nearly all rural families have a sewing machine, generally the treadle type.

Based on data from these studies, space requirements for home food preservation and for the storage of household textiles and clothing are now being determined by the Bureau. In addition, studies of space requirements for some other types of household needs are under way in each region.

Expansible Farmhouse Plans

Because the expansible type of house provides a satisfactory home for a man and wife for a relatively low cash expenditure and, as the family grows or the budget permits, can be added to without

altering the basic unit, the Bureau has continued work on developing plans for expansible houses. Six such plans have been completed cooperatively with the Bureau of Plant Industry, Soils, and Agricultural Engineering.

Basic units of three of these houses consist of a combined living and sleeping area, a combined kitchen and dining area, and a bathroom. Two or three bedrooms can be added later. The basic units of two houses contain a living room, combined kitchen and dining area, a bedroom, and a bath. Plans show how as many as three bedrooms and a utility room can be added as needed. A sixth expansible house plan provides an attic which may be converted into two bedrooms.

Plans and working drawings for these house plans are available to farmers through the agricultural engineer of the Extension Service in many States. Leaflets illustrating five of these plans have been published and supplied to State offices of the Extension Service and the Farmers Home Administration for distribution to interested farm families.

Following two of the plans, three expansible houses are now under construction at the Agricultural Research Center, Beltsville, Md. Upon completion they will be occupied by workers of the Bureau of Dairy Industry. Researchers will study the houses for convenience to these families and will obtain data on such details as durability and ease of care of different finishes under actual living conditions. Later, the houses will be expanded by addition of bedrooms and other space.

Posters showing floor plans and colored renderings of the houses have been prepared for display in local offices of the Farmers Home Administration in the Columbia River Basin, where it is believed that the plans can be of special usefulness.

Fluctuating Temperatures in Home Freezers

Experiments were conducted in cooperation with the Agricultural Experiment Stations of Iowa, Minnesota, and Cornell University to determine the maximum range of temperature fluctuations that would not affect the quality of stored food in home freezers. The findings are basic to the establishing of performance requirements needed for developing standards for freezers and for use by manufacturers in producing freezers that will maintain desirable quality in stored frozen food.

Comparisons were made of the quality of food stored at fluctuating temperatures with that of food stored at 0° F. Under the conditions studied, food stored for no longer than 6 months at temperatures fluctuating from 0° to 10° or 0° to 13° F. was little different in quality from that stored at 0° F. Longer storage periods with temperatures fluctuating from 0° to as high as 20° F. caused a noticeable decrease in the quality of some stored foods. Temperatures held as near to 0° F. as possible maintained quality best in frozen food stored for periods of more than 6 months.

OTHER SERVICES IN NUTRITION AND HOME ECONOMICS

Insofar as possible, the Bureau has responded to requests from defense and other agencies to supply technical information and the consultant services of staff. As examples:

A Bureau nutritionist assisted with a 3-week international conference in England on administrative and technical aspects of disaster feeding. At the request of the American National Red Cross, the Bureau's quantity service food laboratory tested and standardized 43 large-quantity recipes for a proposed Red Cross manual for canteen and emergency feeding. To meet a request of the Quartermaster General's office, information was compiled on vitamin retention during storage at different temperatures in canned citrus products, tomatoes, certain other vegetables, and meat, and in dehydrated sweet-potatoes. Quantities of food providing a nutritionally good diet for 1 day for 100 persons, with menus showing use, were worked out for the Department of Labor to use in contracting with restaurateurs in Southern States for the feeding of Mexican laborers entering this country to work on farms.

A publication on planned spending found useful during World War II was revised as an information aid to women in Government service in Washington, at request of personnel officers of the Federal Government. Many such officers advise prospective employees as to kinds and probable costs of living arrangements available to a newcomer in the first few months. Supplementing such temporary aid, the Bureau publication, *How to Make a Spending Plan—Suggestions for Single Government Women in Washington*, gives primary emphasis to developing a plan for personal spending to meet needs over a longer period. The publication points out the variation in spending patterns that exist among single women in a particular locality and the interdependency of expenditures for the various goods and services. For instance, the type of housing chosen—furnished room, shared apartment, or apartment alone—determines to a large degree the spending for food, transportation, furnishings, recreation, and also savings. The publication has already been requested by a number of Government agencies, and is meeting a Bureau need for material to answer calls from organizations as to how budgeting principles can be applied to needs of specialized groups.

Staff members have participated as consultants in the work of the Food and Agriculture Organization of the United Nations and in planning some parts of technical assistance projects. They have shared information with scientists and other workers from abroad brought to the Department under various programs. Last year 887 such visitors came from 62 countries outside the United States. Related to this international work and to needs of both military and civilian groups is a compilation of data on composition of foods used in Far Eastern countries, published during the year. Drawing on its records of the world's scientific literature on food composition, the Bureau put into tabular form data on 362 food items and added a bibliography of 345 references to original sources—many of them publications little known outside the Far East.

SUMMARY OF RESEARCH PUBLICATION

Carrying out its responsibility to report promptly to the public findings of its research, the Bureau published or sent to press during the year 44 new popular or technical bulletins issued through the Government Printing Office or the Department and 67 technical articles printed in technical and professional journals.

In addition to its publications, the Bureau uses many other means of bringing the results of its research to the attention of the public. For example, 63 press releases and special statements were prepared for food editors and women's page editors of newspapers, magazine editors, directors of women's radio and television programs, home economists in business, and Extension workers. Seventeen popular articles were published in farm and women's magazines, and 16 radio and television scripts were prepared and broadcast, mostly on Nation-wide hook-ups. Exhibits of Bureau research and its publications were displayed at national meetings of three professional organizations: The American Home Economics Association, American Dietetic Association, and American School Food Service Association. Twenty-nine papers or talks were given by Bureau staff before professional groups. The 5 motion pictures that have been prepared by the Bureau dealing with its research, were shown to 22,750 audiences by home economics groups in the States and in the schools, and were viewed by more than 1 million persons. More than 2,500 persons from the 48 States and from 62 countries outside the United States visited the Bureau's laboratories and saw at first hand the research under way.

Public interest in the Bureau's research and its publications is evidenced by the year's distribution figures for publications. Almost 5½ million copies of the 160 publications currently available through the Government Printing Office were distributed on request.

